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EXAMINER	
FORMAN, BETTY J	

ART UNIT	PAPER NUMBER
1634	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/042,911	KELLEY ET AL.	
	Examiner	Art Unit	
	BJ Forman	1634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 March 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14,16-43,60 and 61* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14 16-43 60-61* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

FINAL ACTION

Status of the Claims

1. This action is in response to papers filed 10 March 2004 in which Figure 16 was amended, a paper and computer readable form of the Sequence listing was submitted, claims 1-2, 4, 8-9, 11-14, 16-18, 20-26, 29-31, 33, 36, 39, 41 were amended, claims 15 and 44-59 were canceled and claims 60-61 were added. All of the amendments have been thoroughly reviewed and entered.

The previous objections and rejections in the Office Action dated 10 November 2003, not reiterated below, are withdrawn in view of the amendments and Sequence Listing. All of the arguments have been thoroughly reviewed and are discussed below as they apply to the instant rejections. New grounds for rejection, necessitated by amendment are discussed.

Claims 1-14, 16-43 and 602-61 are under prosecution.

Claim Rejections - 35 USC § 112

35 U.S.C. 112: first paragraph

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1-14, 16-43 and 60-61 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject

matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The recitation "said proximal ends attached directly to a substrate" is added to the newly amended independent claims 1 and 24 (from which all other claims depend). However, the specification fails to define or provide any disclosure to support such claim recitation. The specification teaches the carbon nanotube grown on a substrate (e.g. page 12, lines 21-23). However, the instantly claimed "attached directly" encompasses numerous and various attachments e.g. attachment of pre-made nanotube onto a substrate via a linker, via a functional group, via covalent bond, via hydrogen bond, via hydrophilic/hydrophobic interaction and etc. As such, the instantly claimed attachment encompasses a very large genus of attachments. In contrast, the specification teaches a single means of attachment i.e. growth of the nanotube. Because the specification does not teach the broadly claimed attachment, the amendment introduces new matter.

MPEP 2163.06 notes "IF NEW MATTER IS ADDED TO THE CLAIMS, THE EXAMINER SHOULD REJECT THE CLAIMS UNDER 35 U.S.C. 112, FIRST PARAGRAPH - WRITTEN DESCRIPTION REQUIREMENT. *IN RE RASMUSSEN*, 650 F.2D 1212, 211 USPQ 323 (CCPA 1981)." MPEP 2163.02 teaches that "Whenever the issue arises, the fundamental factual inquiry is whether a claim defines an invention that is clearly conveyed to those skilled in the art at the time the application was filed...If a claim is amended to include subject matter, limitations, or terminology not present in the application as filed, involving a departure from, addition to, or deletion from the disclosure of the application as filed, the examiner should conclude that the claimed subject matter is not described in that application." MPEP 2163.06 further notes "WHEN AN AMENDMENT IS FILED IN REPLY TO AN OBJECTION OR REJECTION BASED ON 35 U.S.C. 112, FIRST PARAGRAPH, A STUDY OF THE ENTIRE APPLICATION IS OFTEN NECESSARY TO DETERMINE WHETHER OR NOT "NEW MATTER" IS INVOLVED. *APPLICANT SHOULD THEREFORE SPECIFICALLY POINT OUT THE SUPPORT FOR ANY AMENDMENTS MADE TO THE DISCLOSURE*" (emphasis added).

35 U.S.C. 112: second paragraph

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 16 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 16 is indefinite for the recitation "at least two nanotube tubules" because the recitation lacks proper antecedent basis in the "at least one" of Claim 1.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1, 3-5, 7-8, 11-14, 17-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbert et al (WO 98/05920, published 12 February 1998) in view of Lieber et al (U.S. Patent No. 6,159,742, issued 12 December 2000).

Regarding Claim 1, Colbert et al disclose a carbon nanotube array device comprising at least one nanotubule with a proximal end and a distal end, said proximal end attached to a

substrate wherein the attachment is direct i.e. the nanotube is used as formed on the original substrate (page 39, lines 24-30) and an electrically conductive biological compound attached to the nanotube (e.g. enzyme-moiety binding), hydrogen bonding (e.g. hybridization) or covalent bonding (page 23, line 1-page 24, line 7) or nucleic acid, amino acid, enzyme, protein or (e.g. page 23, line 6-page 24, line 7). Colbert et al teach the nanotube comprises a metallic material (page 37, line 24-page 38, line 19) but they do not specifically teach the metallic material is at the distal end wherein the biological compound is attached to the metallic material.

However, carbon nanotubes having metallic material at distal ends for attachment of biomolecules was well known in the art at the time the claimed invention was made as taught by Lieber et al (Fig. 1). Lieber et al further teach the metallic material provides for covalent, ionic, or dative binding of the biomolecule to the nanotube (Column 4, lines 21-24) whereby the binding force between single protein-ligand pairs are measured (Column 3, lines 51-55). It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the carbon nanotube of Colbert et al by attaching the biomolecule to metallic material at the distal end of the nanotube for the expected benefit of measuring binding force between single protein-ligand pairs as taught by Lieber et al (Column 3, lines 51-55).

Regarding Claim 3, Colbert et al disclose the device wherein the tubule is a single wall or multi-wall carbon nanotube (page 6, lines 20-22).

Regarding Claim 4, Colbert et al disclose the device wherein the metallic material comprises at least one metallic compound e.g. nickel or copper (page 8, lines 14-16).

Regarding Claim 5, Colbert et al disclose the device wherein the metallic material comprises at least one metallic compound e.g. nickel, platinum or cobalt (page 41, lines 19-21).

Regarding Claim 7, Colbert et al disclose the device wherein the metallic material is located at the distal end of the tubule i.e. the metallic material is integrated during tubule growth and therefore is at the distal end as well as throughout the tubule (page 41, lines 3-24).

Regarding Claim 8, Colbert et al disclose the device wherein the metallic material is present as a surface coating (page 14, lines 23-29)

Regarding Claim 11, Colbert et al do not teach a non-metallic substrate. However, Lieber et al teach the similar device wherein the substrate is non-metallic i.e. silicon (Column 4, lines 16-18).

Regarding Claim 12, Colbert et al disclose the device wherein the substrate is an electrically semi-conducting material e.g. gold, mercury (page 6, lines 26-page 7, line 23; page 39, lines 3-7; and Fig. 8) and Lieber et al teach a semi-conducting material i.e. silicon (Column 4, lines 16-18).

Regarding Claim 13, Colbert et al disclose the device wherein the substrate is an electrically semi-conducting material (page 6, lines 26-page 7, line 23; page 39, lines 3-7; and Fig. 8) and Lieber et al teach the semi-conducting material is silicon (Column 4, lines 16-18).

Regarding Claim 14, Colbert et al disclose the device further comprising at least one biological molecule (page 21,line 20-page 22, line 6 and page 24, lines 1-7) and Lieber et al teach the biological molecules is chemically bonded to the metallic material (Column 3, lines 56-65 and Column 4, lines 21-24).

Regarding Claim 17, Colbert et al disclose the device wherein the biological compound is immobilized via surface adsorption, ionic bonding (e.g. enzyme-moiety binding), hydrogen bonding (e.g. hybridization) or covalent bonding (page 23, line 1-page 24, line 7).

Regarding Claim 18, Colbert et al disclose the device wherein the biological compound is includes a linker e.g. thiol, or disulfide (page 35, lines 17-28 and page 39, lines 7-11).

Regarding Claim 19, Colbert et al disclose the device wherein the biological compound is includes thiol (page 35, lines 17-28).

Regarding Claim 20, Colbert et al disclose the device wherein the compound is a nucleic acid, amino acid, enzyme, protein or derivatives thereof (e.g. page 23, line 6-page 24, line 7).

Regarding Claim 21, Colbert et al disclose the device wherein the biological compound is a derivatized nucleic acid, amino acid, enzyme, protein, or segment thereof (e.g. page 23, line 6-page 24, line 7 and 39, lines 7-11).

Regarding Claim 22, Colbert et al disclose the device wherein the biological compound is DNA (page 24, lines 4-7).

Regarding Claim 23, Colbert et al disclose the device wherein the biological compound is DNA which is a derivative of single stranded DNA (page 24, lines 4-7) and Lieber et al teach the biological compound is a polynucleotide which is a derivative of single stranded DNA (Column 4, lines 59-67).

8. Claims 2 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbert et al (WO 98/05920, published 12 February 1998) in view of Lieber et al (U.S. Patent No. 6,159,742, issued 12 December 2000) as applied to Claim 1 above and further in view of Saraf et al (U.S. Patent No. 6,656,693, filed 17 September 1998) OR Mirkin et al (U.S. Patent No. 6,506,564, filed 26 June 2000) OR Connolly (U.S. Patent No. 6,399,303, filed 7 August 2000).

Regarding Claims 2 and 16, Colbert et al and Lieber et al disclose a carbon nanotube array device as describe above wherein the device senses, measures, analyzes and manipulates objects with nanometer resolution (Colbert, page 3, lines 19-24 and Lieber, Column 3, lines 51-

55). Colbert and Lieber do not teach a pair of nanotubes bridged by the electrically conductive compound.

However bridging electrically conductive biological compounds was well known in the art at the time the claimed invention was made as taught by each of Saraf et al, Mirkin et al and Connolly.

Saraf et al teach a device comprising a substrate having pairs of electrodes coated with metallic material positioned proximally on the substrate wherein the distal ends of the electrodes are bridged by electrically conductive DNA (Column 3, lines 13-28; Column 7, line 58-Column 8, lines and Fig. 1-5) wherein the device overcomes problems associated with photolithographic techniques (Column 2, lines 54-56).

Mirkin et al also teach a device comprising a substrate having pairs of electrodes positioned proximally and bridged by electrically conductive DNA (Fig. 41) whereby target DNA are detected by a dramatic increase in conductivity (Column 92, lines 20-25) and whereby thousands of complementary DNA targets can be detected simultaneously (Column 92, lines 59-67).

Furthermore, Connolly teaches a device comprising a substrate having pairs of electrodes positioned proximally and bridged by electrically conductive DNA whereby bridging provides "extremely sensitive" target molecule detection (Column 2, lines 22-59).

Hence, bridging of biological compounds between arrayed structures to establish electrical contact between the structures was well known in the art at the time the claimed invention was made. And it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the arrayed carbon nanotubes of Colbert and Lieber by bridging biological compounds between them as taught by Saraf et al, Mirkin et al and Connolly. One of ordinary skill would have been motivated to do so based the teaching of Saraf et al wherein the device overcomes problems associated with photolithographic techniques (Column 2, lines 54-56) and/or based on the extremely sensitive target detection

taught by Connolly (Column 2, lines 22-59) and/or based on the dramatic increase in conductivity whereby thousands of complementary DNA targets can be detected simultaneously as taught by Mirkin et al (Column 92, lines 20-25 and 59-67).

9. Claims 24-27, 29-30, 32-39, 41-43, 60 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbert et al (WO 98/05920, published 12 February 1998) in view of Lieber et al (U.S. Patent No. 6,159,742, issued 12 December 2000) and further in view of Saraf et al (U.S. Patent No. 6,656,693, filed 17 September 1998) OR Mirkin et al (U.S. Patent No. 6,506,564, filed 26 June 2000) OR Connolly (U.S. Patent No. 6,399,303, filed 7 August 2000).

Regarding Claim 24, disclose a carbon nanotube array device comprising at least one nanotubule with a proximal end and a distal end, said proximal end attached to a substrate wherein the attachment is direct i.e. the nanotube is used as formed on the original substrate (page 39, lines 24-30) and an electrically conductive biological compound attached to the nanotube (e.g. enzyme-moiety binding), hydrogen bonding (e.g. hybridization) or covalent bonding (page 23, line 1-page 24, line 7) or nucleic acid, amino acid, enzyme, protein or (e.g. page 23, line 6-page 24, line 7). Colbert et al teach the nanotube comprises a metallic material (page 37, line 24-page 38, line 19) but they do not specifically teach the metallic material is at the distal end wherein the biological compound is attached to the metallic material.

However, carbon nanotubes having metallic material at distal ends for attachment of biomolecules was well known in the art at the time the claimed invention was made as taught

by Lieber et al (Fig. 1). Lieber et al further teach the metallic material provides for covalent, ionic, or dative binding of the biomolecule to the nanotube (Column 4, lines 21-24) whereby the binding force between single protein-ligand pairs are measured (Column 3, lines 51-55). It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the carbon nanotube of Colbert et al by attaching the biomolecule to metallic material at the distal end of the nanotube for the expected benefit of measuring binding force between single protein-ligand pairs as taught by Lieber et al (Column 3, lines 51-55). Colbert and Lieber do not teach a pair of nanotubes bridged by the electrically conductive compound.

However bridging electrically conductive biological compounds was well known in the art at the time the claimed invention was made as taught by each of Saraf et al, Mirkin et al and Connolly.

Saraf et al teach a device comprising a substrate having pairs of electrodes coated with metallic material positioned proximally on the substrate wherein the distal ends of the electrodes are bridged by electrically conductive DNA (Column 3, lines 13-28; Column 7, line 58-Column 8, lines and Fig. 1-5) wherein the device overcomes problems associated with photolithographic techniques (Column 2, lines 54-56).

Mirkin et al also teach a device comprising a substrate having pairs of electrodes positioned proximally and bridged by electrically conductive DNA (Fig. 41) whereby target DNA are detected by a dramatic increase in conductivity (Column 92, lines 20-25) and whereby thousands of complementary DNA targets can be detected simultaneously (Column 92, lines 59-67).

Furthermore, Connolly teaches a device comprising a substrate having pairs of electrodes positioned proximally and bridged by electrically conductive DNA whereby bridging provides "extremely sensitive" target molecule detection (Column 2, lines 22-59).

Hence, bridging of biological compounds between arrayed structures to establish electrical contact between the structures was well known in the art at the time the claimed invention was made. And it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the arrayed carbon nanotubes of Colbert and Lieber by bridging biological compounds between them as taught by Saraf et al, Mirkin et al and Connolly. One of ordinary skill would have been motivated to do so based the teaching of Saraf et al wherein the device overcomes problems associated with photolithographic techniques (Column 2, lines 54-56) and/or based on the extremely sensitive target detection taught by Connolly (Column 2, lines 22-59) and/or based on the dramatic increase in conductivity whereby thousands of complementary DNA targets can be detected simultaneously as taught by Mirkin et al (Column 92, lines 20-25 and 59-67).

Regarding Claim 25, Colbert et al disclose the device wherein the tubule is a single wall or multi-wall carbon nanotube (page 6, lines 20-22).

Regarding Claim 26, Colbert et al disclose the device wherein the metallic material comprises at least one elemental metal, metallic alloy or combination e.g. nickel or copper (page 8, lines 14-16).

Regarding Claim 27, Colbert et al disclose the device wherein the metallic material is selected from e.g. nickel, platinum or cobalt (page 41, lines 19-21).

Regarding Claim 29, Colbert et al disclose the device wherein the metallic material is located at the distal end of the tubule i.e. the metallic material is integrated during tubule growth and therefore is at the distal end as well as throughout the tubule (page 41, lines 3-24).

Regarding Claim 30, Colbert et al disclose the device wherein the metallic material is present as a surface coating (page 14, lines 23-29).

Regarding Claim 32, Colbert et al disclose the device wherein the biological compound is DNA which is a derivative of single stranded DNA (page 24, lines 4-7) and Lieber et al teach the biological compound is a polynucleotide which is a derivative of single stranded DNA

(Column 4, lines 59-67). Furthermore, Mirkin et al teach the biological compound is a single stranded DNA (Column 92, lines 30-67) and Saraf et al teach the biological compound is a single stranded DNA (Column 5, lines 42-49).

Regarding Claim 33, Colbert et al disclose the device wherein an electrical contact is established between at least two nanotubes in the array i.e. via attachment to the support, an electrical contact is established between the nanotubes (page 7, lines 4-21).

Regarding Claim 34, Colbert et al disclose the device wherein the biological compound is immobilized via surface adsorption, ionic bonding (e.g. enzyme-moiety binding), hydrogen bonding (e.g. hybridization) or covalent bonding (page 23, line 1-page 24, line 7).

Regarding Claim 35, Colbert et al disclose the device wherein the biological compound is chemically derivatized to include a linker e.g. thiol or disulfide (page 35, lines 17-28 and page 39, lines 7-11).

Regarding Claim 36, Colbert et al disclose the device wherein the biological compound is chemically derivatized to include a linker i.e. thiol (page 35, lines 17-28).

Regarding Claim 37, Colbert et al disclose the device wherein the compound is a nucleic acid, amino acid, enzyme, protein or derivatives thereof (e.g. page 23, line 6-page 24, line 7).

Regarding Claim 38, Colbert et al disclose the device wherein the biological compound is a derivatized nucleic acid, amino acid, enzyme, protein, or segment thereof (e.g. page 23, line 6-page 24, line 7 and 39, lines 7-11).

Regarding Claim 39, Colbert et al disclose the device wherein the biological compound is DNA (page 24, lines 4-7).

Regarding Claims 41-43, Colbert et al disclose the device wherein the device senses and detects various biological compounds (page 21, line 20-page 22, line 6 and page 23, line 1-page 24, line 7). However, it is noted that the recitation intended use "capable of sensing and detecting...."does not describe or define the structural components of the device.

Regarding Claims 60 and 61, the claims are drawn to and intended use or function of the device of Claim 24 i.e. contact between the tubules provides electrical charge (Claim 60) and the biological compound interacts with a target to produce a change in electrical conductivity. While Saraf et al, Mirkin et al and Connolly teach the bridging provides electrical charge conduction and target species interaction produces a change in conductivity (Saraf et al, Column 3, lines 13-28; Column 7, line 58-Column 8, lines and Fig. 1-5); (Mirkin et al, Column 92, lines 20-25) and (Connolly, Column 2, lines 22-59), the recitation of an intended use or function does not describe or define the device over the prior art.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Colbert et al (WO 98/05920, published 12 February 1998) in view of Deguchi et al (U.S. Patent No. 6,400,091, filed 14 March 2000).

Regarding Claim 6, Colbert et al disclose a carbon nanotube array device comprising at least one nanotube with a proximal end and a distal end, said proximal end attached to a substrate and said tubule further comprising a metallic material (page 38, line 25-page 39, line 23 and Fig. 8) wherein the metallic material is selected from one of several metals e.g. nickel, platinum or cobalt (page 41, lines 19-21) but they do not teach the metallic material is gold. However, it was well known in the art at the time the claimed invention was made that carbon nanotube preferably contained gold as taught by Deguchi et al (Column 6, lines 39-61) wherein the addition of metals such as gold prevent nanotube from being denatured (Column 6, lines 46-49). It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the nanotubes of Colbert et al by incorporating gold as taught by Deguchi et al for the expected benefit of preventing the nanotubes from being denatured as taught by Deguchi et al (Column 6, lines 46-49).

11. Claims 9, 10, 23, 31, 32 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colbert et al (WO 98/05920, published 12 February 1998) in view of Massey et al (U.S. Patent No. 5,866,434, issued 2 February 1999).

Regarding Claims 9, 10, 31 and 32, Colbert et al disclose a carbon nanotube array device comprising at least one nanotube with a proximal end and a distal end, said proximal end attached to a substrate and said tubule further comprising a metallic material (page 38, line 25-page 39, line 23 and Fig. 8) but they do not teach the device wherein the metallic material is particulate (e.g. bead) and at a terminal end of the nanotube. However, Massey et al teach a similar device comprising at least one nanotube comprising metallic material at a terminal end wherein the metallic material is a magnetic bead (Column 54,a lines 1-20). Massey et al further teach the magnetic bead at a terminal end "dramatically" improves the surface area (Column 54, lines 5-8) and are "extremely useful" for separation assays (Column 52, lines 36-42). Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the nanotubes of Colbert et al by providing a magnetic bead at a terminal end as taught by Massey et al for the expected benefit dramatically improving surface area and easy separation as taught by Massey et al (Column 52, lines 36-42 and Column 54, lines 1-20).

Regarding Claim 23 and 40, Colbert et al teach the device wherein the biological compound is DNA (page 24, lines 4-7) but they are silent regarding the DNA being single-stranded. However, Massey et al teach the similar device wherein the biological compound is single-stranded DNA (Column 53, lines 52-67) whereby the DNA probe assays are performed with dramatically improved surface area (Column 54, lines 1-20). It would have been obvious

to one of ordinary skill in the art at the time the claimed invention was made to apply the single-stranded DNA of Massey et al to the DNA taught by Colbert et al for the expected benefit of performing DNA probe assays with dramatically improved surface area as taught by Massey et al (Column 54, lines 1-20).

Remarks

12. Applicant's arguments have been considered but are deemed moot in view of the amendments, withdrawn rejections and new grounds for rejection.

However, it is noted that Applicant arguments address numerous elements which are not limitations of the claims e.g. nanotubules grown directly on the surface of the substrate; individual nanotubes on the substrate at predetermined sites; precise placement of the nanotubules. These elements are not claimed and therefore comments directed toward theses elements are not commensurate in scope with the instant claims.

Furthermore, Applicant argues that the applied references teach elements not claimed e.g. Massey requires an assay-performance-substance linked to the ECL compound.

The additional elements taught by the cited references are encompassed by the open claim language "comprising" recited in the instant claims.

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Conclusion

14. No claim is allowed.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BJ Forman whose telephone number is (571) 272-0741. The examiner can normally be reached on 6:00 TO 3:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on (571) 272-0782. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BJ Forman, Ph.D.
Primary Examiner
Art Unit: 1634
May 19, 2004